

Chapter 5 Part 2

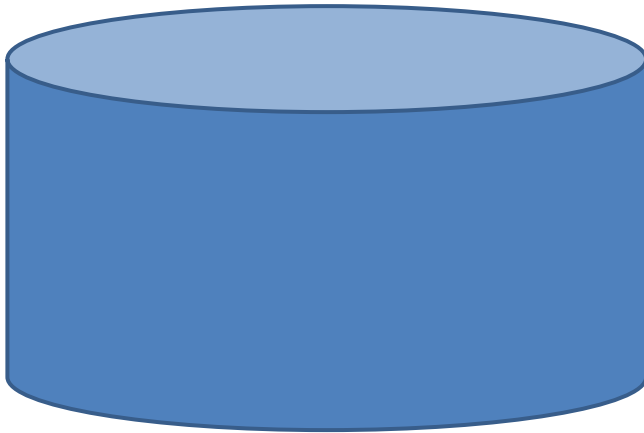
Dr. Turner

Energy transfer

Hot rock



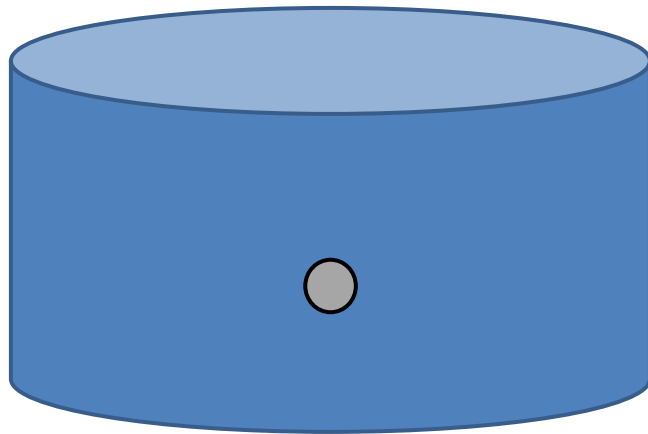
Cold pool of water



Energy transfer

Is any energy destroyed?

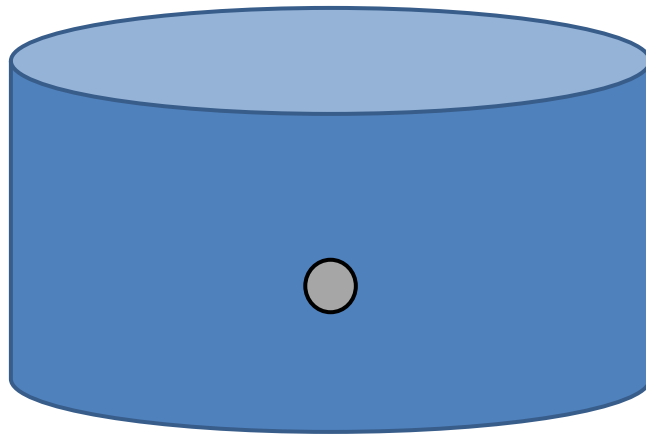
Rock in pool of water



Energy transfer

Is any energy destroyed?

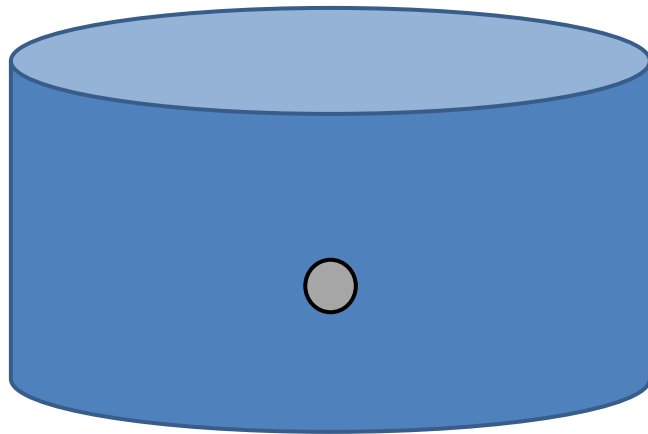
Rock in pool of water



Energy is transferred from what to what?

Energy transfer

Rock in pool of water



Is the process of the pool gaining energy endothermic or exothermic?

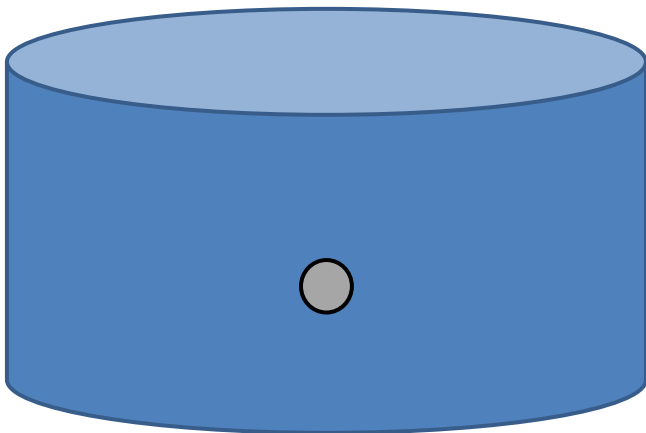
Is the process of the rock losing energy endothermic or exothermic?

Energy transfer

$$\text{Heat} = \text{Energy of a system after a process} - \text{Energy of a system before a process}$$

Since energy cannot be created or destroyed, the amount of energy gained by the pool has to be the same as the amount of energy lost by the rock

Rock in pool of water

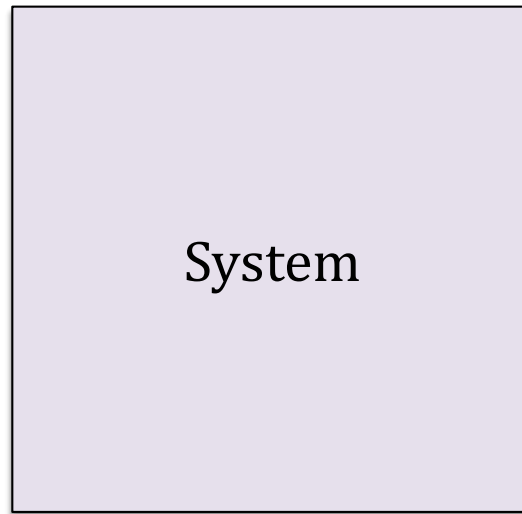


Since the pool gains this amount of energy, its heat is positive.

Since the rock loses this amount of energy, its heat is negative.

$$q_{\text{pool}} = -q_{\text{rock}}$$

Direction of energy transfer (Perspective matters!)



Surroundings

Energy transfer

$$q_{\text{rock}} = -q_{\text{pool}}$$

$$q_{\text{system}} = -q_{\text{surroundings}}$$

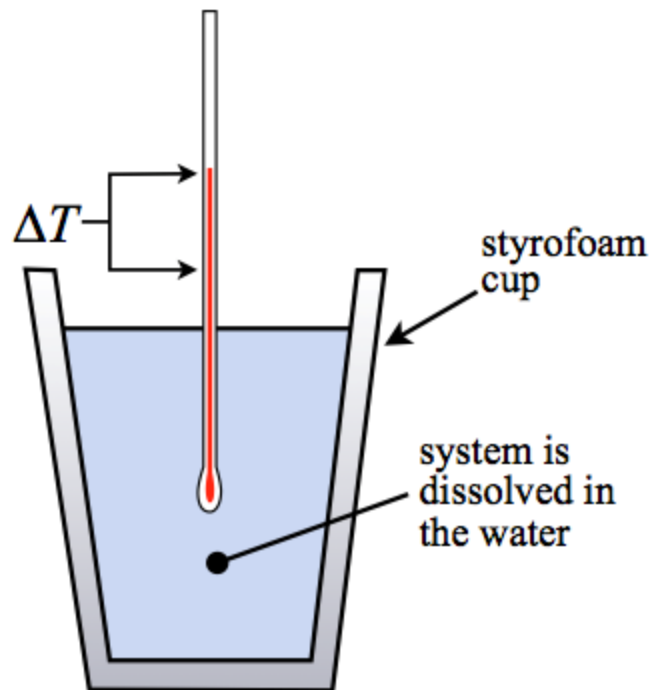
$$q_{\text{system}} + q_{\text{surroundings}} = 0$$

Energy transfer

A 118 g rock at 126.5 °C is dropped into a pool with 197 g of water. This causes the temperature of the water to rise from 22.7 to 79.2°C. Determine the specific heat of the rock. The specific heat of water is 4.184 J g⁻¹ °C⁻¹.

Calorimetry

Coffee-cup calorimeter



- Calorimeters are devices used to measure heat
- The science of using a calorimeter is called calorimetry

Energy transfer

A 1.000 kg sample of magnesium at 40.0 °C is added to 1.000 kg of water maintained at 20.0 °C in a coffee-cup calorimeter. The specific heat capacity of water is 4.184 J g⁻¹ °C⁻¹, and the molar heat capacity of magnesium is 24.869 J mol⁻¹ K⁻¹. (A) Calculate the specific heat capacity of magnesium in the units J g⁻¹ °C⁻¹ (B) What will be the final temperature of the Mg-H₂O mixture?